HEADQUARTERS
AIR FORCE SPECIAL WEAPONS CENTER
AIR FORCE SYSTEMS COMMAND
KIRTLAND AIR FORCE BASE, NEW MEXICO

FINAL REPORT

ON

AIR FORCE PARTICIPATION

IN

PROJECT RULISON

1 October 1969

Prepared by:

CONTINENTAL TEST DIVISION
DIRECTORATE OF NUCLEAR FIELD OPERATIONS

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FINAL REPORT - AIR FORCE PARTICIPATION

IN

PROJECT RULISON

1 October 1969

1. References:

a. Air Force Systems Command Operations Plan 15-66, 15 October 1966 (Confidential).

b. Appendix 4 to Annex K, Air Force Systems Command Operations Plan 15-66 (Project RULISON), 23 April 1969, as changed.

c. Frag Order 69-1, Air Force Special Weapons Center Detachment 2 (Provisional)(Project RULISON), 3 September 1969.

d. USAEC Test Manager's Operations Order Project RULISON (NV-OPO-1-69), 9 June 1969, as changed.

e. USAEC Director of Nuclear Operations Operation Plan - Project RULISON, 28 August 1969.

2. General:

a. Project RULISON was the second PLOWSHARE (peaceful uses of nuclear explosives) program underground detonation to determine the feasibility of stimulating the flow of natural gas by nuclear explosives. The first project in this program was Project GASBUGGY executed on 10 December 1967 at Farmington, New Mexico.

b. The Atomic Energy Commission, Department of the Interior, and the Austral Oil Company of Houston, Texas, cooperated in this experiment which was conducted at a site located near Grand Valley in Garfield County, Colorado.

Surface Zero was located approximately 40 air miles northeast of Grand Junction, Colorado (39 degrees 24 minutes 03 seconds North latitude, 107 degrees 56 minutes 45 seconds West longitude). The technical program was conducted by the Los Alamos Scientific Laboratory. Program management was provided by CER Geonuclear Corporation of Las Vegas, Nevada. The device, with an expected yield of 40 KT, was buried at a depth of 8,430 feet. The detonation, which was completely contained, was expected to produce a large chimney of crushed rock from which numerous cracks and fractures would radiate into the surrounding gas bearing rock. A successful experiment would increase the flow of natural gas from the rock formation. The device was successfully detonated at 2100Z hours on 10 September 1969. All delays from the originally scheduled detonation date of 4 September 1969 were caused by adverse winds. Air support for this test was arranged by the Continental Test Division, Directorate of Nuclear Field Operations, Headquarters Air Force Special Weapons Center (AFSC), Kirtland AFB, New Mexico. USAF aircraft support consisted of two UH-1F helicopters. Helicopter requirements were levied on the AFSWC by Test Command/Defense Atomic Support Agency (TC/DASA) in February 1969.[1] The request for helicopters did not specify in-place dates, however, plans were

1. Letter TC/DASA (TCDR-C) to Hq AFSWC (SWNC), 19 February 1969, Subject: Air Support-RULISON in response to USAEC message DTG 171647Z February 1969.

based on both helicopters being in-place on D-5 days. The helicopter missions were originally: security sweeps, CCTV, and special flights as requested by the Test Manager (T/M). The Continental Test Division and Materiel Division arranged such other support as was required.

3. Planning for Project RULISON: Planning for Project RULISON started in February 1969 with a trip to NVOO by Lt Col Joseph Karol (then Chief of the Continental Test Division). Basic requirements and project details were discussed at this meeting. An orientation visit to Grand Junction and the test site area was made on 18-19 March 1969 and served as the basis for planning air support.[2] Operational concepts were developed as direct result of these visits. Most of the facilities that were later used for Project RULISON were investigated and arranged for during the latter pre-operational visit. The operations plan for Project RULISON was written, based on the TC/DASA aircraft requirements and the information and arrangements resulting from the orientation visit, and was published on 23 April 1969 as Appendix 4 to Annex K, Air Force Systems Command Operations Plan 15-66 (Project RULISON), (See Attachment 1). A resource requirements plan, dated 24 March 1969, and included as an attachment to the Logistics Tab of Appendix 3, was distributed under separate cover to all agencies providing support. The resource requirements plan documented all known personnel and materiel requirements.

2. See Trip Report 24 March 1969 on file in SWNC.

Planned execution was slipped from 1 May 1969 to 4 September 1969 (USAEC message UNCLAS DTG 171825Z July 1969) for technical reasons. As planning continued for deployment, the basic concepts and requirements were proven valid and only minor changes were necessary.

a. The following recommendations for future planning purposes are suggested:

(1) A wind sock, 2 to 3 feet long with necessary hardware and 30' mast is in the possession of the Materiel Directorate and should be used on all future projects of this type. If an emergency field or landing area is to be used, then more than one wind sock is required.

(2) All vehicles obtained to satisfy project requirements be thoroughly road-tested by SWN personnel prior to deployment. Prior to RULISON some vehicles were not properly checked prior to dispatch. The result was an excessive consumption of manhours and funds to maintain them in an operational condition until return to home base.

(3) Suitable ground C&E equipment should be on hand to permit relay operation of one UHF channel from the operations Coordination Center, Air Advisors position.

b. The following general comments apply to any future off-site test:

(1) The value of the pre-operational site field trip cannot be overemphasized. It is a "must" in any future deployments.

(2) The Detachment "X" (Provisional) authority to cut T-series flight orders is mandatory and avoids problems due to last-minute changes.

(3) AEC missions should be specified and documented in an AEC operation plan at least 10 days prior to D-Day.

(4) In case of a helicopter pad remote from the OCC, a telephone line is preferred over a discrete net radio.

4. Command and Control: Air Force Special Weapons Center Detachment 2 (Provisional) was activated by Headquarters Air Force Systems Command as of 0001 hours, 7 May 1969 by AFSC Special Order G-40, 28 April 1969.

Lt Col Max O. Jesperson assumed command of the Detachment (Provisional) at its formation.[3] Deployment of personnel began on 28 August and was complete by 1 September. The detachment was organized into four sections under the Commander: Helicopter Operations; Rad-Safe (with attached medical personnel); Air Operations Center (AOC)(with attached C&E personnel); and the Materiel Section. Due to the remote location of the actual test site, AFSWC Det 2 (Provisional) operated from two locations. The Commander and operational/support functions, including aircraft staging, operated from the FAA classroom at Walker Field, Grand Junction, Colorado. This classroom was an adequate Headquarters for AFSWC Det 2 (Provisional) and was a substitute for an office trailer originally programmed in the resource requirements plan. The second location was a helicopter pad established about 6 miles

3. Hq AFSWC SO G-1, 30 April 1969

north of SGZ. On D-Day all personnel were moved from Walker Field to the helicopter pad. An Air Operations Center was established in the Operations Coordination Center (OCC) trailer in the CP complex 2 miles North of SGZ. The AOC consisted of a VHF radio, RT 723, and a UHF radio, GRA-53, with accessories. Antennas were placed outside the OCC trailer. On D-Day the Commander and Weapons Director were located at the OCC trailer and passed instructions to the helicopter pad by a discrete VHF/FM radio channel furnished by the AEC in lieu of a hot-line telephone. All requests for air support, orientation flights and other aircraft missions in the test area were reviewed by the Commander/Operations Officer for approval or disapproval. The sole source for requests for air support was the OCC. Requests for air support were relayed by net radio from the OCC to the Detachment 2 office. This provided better control for the AEC and reduced the workload for Detachment 2 since requests were consolidated before reaching the Detachment. Forms were provided to the AEC which insured that the information required for each air support request was complete. Only one set of flight orders for the entire project was signed by the Commander. All passengers were manifested and updated manifests were maintained at the Walker Field office. Difficulties encountered during GASBUGGY, when last minute requests were received to fly civilians, were eliminated on RULISON by giving the Commander, AFSWC Detachment 2, authority to publish "TD" series orders permitting civilians to ride in military aircraft.[4]

4. Ltr SWBA to SWNC, Subj: Authority for Publishing Det 2 "TD" Series Orders, 1 May 1969.

Nine such orders were published. There was no requirement for badging. Access rosters were submitted for heliopad access on D-Day, CP area access, and OCC access on D-Day. The USAEC Director of Nuclear Operations Operations Plan - Project RULISON was published on 28 August 1969 and received by Detachment 2 on 1 September 1969. The Frag Order outlining Detachment 2 missions was published on 3 September 1969 (See Attachment 2). A dry run of the air array and pilot orientation, described in Frag Order 69-1, was flown on 1 September without incident. The crews were briefed the morning of the dry run and the missions flown simulating a 2000Z H-Hour. Because of the distance and a malfunctioning refueling tractor, POL deployment to the heliopad was not exercised until D-Day. The Commander was confident because of the results of the dry run that the D-Day missions could be flown in accordance with the Frag Order. Specific details of missions are contained in paragraphs 5 and 6 of this report. Improvement areas for future operations are suggested as follows:

a. The refueling truck was subject to continuous vapor locks and should be equipped with an electric fuel pump or other features to avoid this problem.

b. The command and control link between the Air Advisor's position and the heliopad must be a telephone link for reliability.

5. Operations, Grand Junction Airport (Walker Field): Operations at Grand Junction were conducted from the FAA classroom adjacent to the Flight Service Station. The refueler was sta-

tioned outside the ramp area, while the MD-3 starting unit was stationed next to the fence adjacent to the helicopter parking spaces on the ramp. Helicopter parking spaces were rented from the local civilian agency, Monarch Airways. All flights were coordinated and approved by the Commander or Operations Officer and appropriate flight orders and passenger manifests were prepared prior to actual flight. The AOC at the pad was advised of the take-off times of each flight and then reported the safe arrival of the aircraft at the pad.

a. Aircraft Operations: An early planning decision was that one UH-1F would be obtained from Detachment 1, and AFSC would be requested to provide the second helicopter. AFSC subsequently tasked the 6515th OMS, AF Flight Test Center, Edwards AFB, California to provide the additional helicopter. The Edwards helicopter, tail number 65-7965, arrived at Indian Springs 2120Z 29 August. This aircraft and the AFSWC Detachment 1 aircraft, tail number 65-7957, departed Indian Springs 1615Z 30 August. The two helicopters (AF 65-7957 and AF 65-7965) arrived on 30 August after a refueling stop at Cedar City, Utah, using a refueling unit which had previously been deployed for this purpose to that location by Nellis AFB.

b. Mission Support Activities: The UH-1F helicopters made an orientation flight to the RULISON test site on the afternoon of 1 September and each made a landing on the helicopter pad to verify its suitability. The UH-1F helicopters

flew a total of 64 sorties for a total of 90.7 flying hours. They carried 149 passengers during the project and accomplished 129 landings. The UH-1F helicopters departed for their home base on 11 September 1969.

c. Simulated Missions: A dry run was conducted on 1 September with a simulated H-Hour of 2000Z. Missions were compressed into an actual time period from about 1930 to 2000Z. All USAF aircraft assumed their H-Hour array positions in accordance with the Frag Order. This practice was considered successful and the array diagram in the Frag Order was considered satisfactory for all USAF participants. The poor radio coverage available from the CP was quite evident during the rehearsal.

d. D-Day Operations: See paragraph 6 for D-Day mission details.

e. Operational Improvements: The final report of Project STERLING, conducted in Mississippi recommended an Air Operations Officer be part of the deployed Detachment staff. This recommendation was not concurred with in the GASBUGGY final report. However, during RULISON, wherein the Detachment Commander and the Weapons Controller were at the OCC, the necesity for an Air Operations Staff Officer was verified.

6. Air Operations Center; Helicopter Pad: The Air Operations Center was established within the Operations Coordination Center trailer in the Command Post complex, about 2.1 miles

north of SGZ. The helicopter pad was located adjacent to the observer point about 6 miles north of SGZ. The area was cleared and leveled in a rectangle about 150' long by 80' wide excluding shoulders. The dirt was wet and was rolled prior to helicopter arrival; after use, the pad was watered only. No chemical binder was used in the water and at times the pad became quite dusty. The water and rolling process seemed to produce a thin crust which served quite well while intact. Near the end of the project the crust was broken in several places and the pad was beginning to fall apart. It is doubtful that it would have been satisfactory much longer.

a. Equipment and Personnel: The Air Operations Center consisted of a position at the end of the table on the Test Manager's Panel located within the Operations Coordination Center. As such, it was only manned completely on shot day. For the daily operations, prior to the shot, air operations were scheduled and controlled remotely from Walker Field. In addition to the USAF radios, one AEC-provided VHF/FM radio was installed for communications to the heliopad in lieu of a hot-line telephone. This provided one channel of VHF and one channel of UHF air-to-ground radio for aircraft control. The antennas for this equipment were mounted outside the OCC trailer on a 30-foot pole obtained at the last minute from the local construction company. A second UHF radio was installed at the heliopad to provide an aircraft monitoring

capability and a back-up link for the AEC provided net radio. The equipment at the OCC trailer was placed on the emergency power source utilized throughout the CP complex, while equipment at the heliopad was operated on an AEC provided generator furnishing power to the whole heliopad/observation area. Two 50-pound fire extinguishers were located at diagonally opposite corners of the helicopter pad to provide fire protection. A wind sock was erected near the helicopter pad by the AEC in response to our logistics requirements. Detachment Commander, Weapons Director Staff Officer, and a radio repairman were at the OCC trailer on D-Day, while all other personnel were at the helicopter pad. This provided more than adequate manning for all operational functions and helicopter pad ground safety security. This latter function became increasingly important as H-Hour neared and activists began demonstrating in the observation area.

b. Communications:

(1) Tactical call signs for Project RULISON were those normally associated with Det 1, Hq AFSWC operations at Indian Springs AFAF and were assigned as follows:

HOBART 1	UH-1F	#7957
HOBART 2	UH-1F	#7965
FARADAY	AOC	
FARADAY ALPHA	Heliopad	

The US Public Health Service Turbo-Beech and B-18 used the permanently assigned call signs of VEGAS 8 and VEGAS 2.

(2) Personal call signs were assigned for use on the AEC net radio system within the Grand Junction area. These call signs were:

FARADAY	Walker Field Office
FARADAY 1	Det 2 Commander (L/C Jesperson)
FARADAY 2	Air Operations Officer (Maj Humphreys)
FARADAY 3	Weapons Director Staff Officer (Maj Thomas)
FARADAY 4	Helo Pilot (Maj Walker)
FARADAY 5	Rad-Safe Officer (Lt Kline)
FARADAY 6	Admin NCO (MSgt Wakabayashi)
FARADAY 7	Materiel (SMSgt Vaughn)
FARADAY 8	A/C Mx (TSgt Owen)

(3) Air-to-ground tactical UHF frequencies 261.1 Mhz and 296.3 Mhz and VHF frequency 126.3 Mhz were authorized for the project. Of these frequencies only 261.1 and 126.3 were used; with the helicopters, HOBART 1 and 2, and VEGAS 8 on UHF, and VEGAS 2 and Colorado Fish and Games aircraft on VHF. Guard channels on both VHF and UHF were monitored continuously.

c. Operations: Actual AOC operations began two days after the arrival of the helicopters on 30 August, although the equipment was checked out and operating on 29 August. The AOC maintained a log of all activity in the test site area on shot day. The air-to-ground communications provided marginal control of the aircraft due to excessive blanking

caused by mountainous terrain in the immediate vicinity. An FAA warning area was established with 5 nautical miles of ground zero from surface level to 15,000 feet MSL to prevent non-project air traffic in the area during the detonation.

(1) Operations at the pad consisted of providing control for helicopter flights of personnel connected with the project. Photographic missions, inspection flights, security sweeps, game surveys and orientation flights were flown in support of the USPHS, LASL, AEC, Austral Oil Company, Wakenhut Service Incorporated (WSI), and Eberline Instrument Corporation (EIC). These missions generally consisted of short flights from the pad to the ground zero area and immediate vicinity. The helicopters were also used occasionally to transport personnel from Grand Junction to the test area and pad since the overland trip took about one hour each way in the vehicles available. In the case of these flights, advance clearance was not required either into or out of the test area since the pad was located 6 miles from SGZ. Several flights were made to the top of Battlement Mesa for equipment placement and two landings were made adjacent to the CP where it was expected that landings might be required under emergency conditions on D-Day.

(2) A practice test array was flown on 1 September with all Air Force aircraft participating. Since array positions as specified in Frag Order 69-1 were dependent on wind direction, likely winds (easterly) were selected and positions

established based on these winds. No AEC signal dry runs were accomplished, so a simulated countdown was broadcast to the array aircraft on 261.1 Mhz. The count was based on the electric clock in the OCC. Pilots reported the countdown was not received on 3 sides: south, east, and west of SGZ.

(3) On D-Day, the two helicopters departed Grand Junction Airport for the pad at 1430Z hours. After dropping the additional Detachment 2 personnel at the pad, they began security sweeps required in Frag Order 69-1. In the meantime, the refueling truck was driven from Grand Junction to the pad. At 1520Z, 22 hunters were found in a known deer camp located $2\frac{1}{2}$ miles SE of SGZ. Heavy rains and a mired vehicle blocked the camp preplanned evacuation route. The Test Manager decided to evacuate all 22 personnel by helicopter, however, personnel would not consent to evacuation unless guaranteed a return trip. There was no choice except to provide the round trip. Civilian releases were signed by all personnel. By 1635Z a total of 22 hunters and 4 dogs had been evacuated to the town of Collbran, Colorado, about 10 miles south of SGZ. At 1635Z the security sweep was resumed and the area of maximum concentration was 4 miles east of CP. There were no positive sightings of activist demonstrators or other unauthorized personnel. Meanwhile, back at the pad, at 1950Z approximately 100 persons demonstrating on the highway broke through the security barricades and started moving towards the observation point and heliopad. They arrived in the

observation point tent on the west edge of the heliopad at 2010Z wherein they caused considerable commotion and threatened to disrupt operations. All available military personnel were placed in strategic locations around the helicopter pad to prevent a ground accident or other disruption of operations. Compounding the problem at this time, the Air Operations Center's only UHF radio became inoperative and forced aircraft control to revert to the helicopter pad. At 1715Z the discrete net radio failed, thereby cutting off all communications with the helicopter pad. Communication with the helicopter pad was restored at 1730Z. At 2025Z several smoke bombs were sighted approximately 020°/2 miles NE of SGZ. Five persons were sighted in the area by aircraft #7965. Aircraft #7957 was loading the documentary photographers at the heliopad when the decision was made to off-load the photographers, board the Federal Marshal and one Sheriff and proceed to the area for removal of the protestors. After aircraft #7957 arrived at 2035Z, only 2 protestors could be located, and it was not until 2055Z that they boarded the helicopter for take-off. Both aircraft were airborne during shot time at 2100Z, after which, aircraft #7957 landed at the heliopad to off-load his passengers. At 2235Z, both aircraft returned to Collbran, Colorado, and transported the hunters to their camp. Rain and hail storms in the area prevented further flight operations. Both aircraft returned to Walker Field at 2330Z.

Aircraft #7957 was returned to Indian Springs AFAF, Nevada, departing Walker Field at 1530Z, 11 September 1969, with refueling at Cedar City, Utah. It arrived at Indian Springs at 2015Z. Aircraft #7965 completed the removal of seismic equipment from the mesa around SGZ, departed Walker Field at 2010Z, refueled at Cedar City, and arrived Indian Springs 0115Z, 12 September 1969.

Aircraft mission utilization was as follows:

Aircraft #65-7957	Aircraft #65-7965
Hours flown: 40.9	Hours flown: 49.8
Sorties: 27	Sorties: 37
Landings: 44	Landings: 85
Passengers flown: 60	Passengers flown: 89

Roll-up of the communications gear began at 2000Z on D+1. This delay was caused by the Test Manager's decision to keep one helicopter on standby during the morning of D+1. All personnel had departed Grand Junction by 1200Z on D+2.

d. Operational Recommendations:

(1) If a trailer is being obtained from AEC sources for USAF use at the heliopad, it must be firmly understood this is an "exclusive" use trailer. USAF radios and equipment had previously been set up and checked out on 2 September. When operations were resumed on 3 September, it was discovered that the communication equipment previously installed for USAF use had been removed from the large front area of the trailer and placed in a small back bedroom. A civilian radio broad-

casting set was in place where the USAF equipment had been. It took approximately four hours to get the required USAF radios working again.

(2) The GRA-53, PRC-41 UHF radios and the RT-723 VHF radios performed well in the environment. Trouble was experienced on D-Day with the GRA-53 radio due to a broken capacitor lead; however, this was repaired by the ground radio repairman augmentee.

(3) In future operations, when commercial jet Type A fuel is available, this fuel should be used instead of trucking JP4 a great distance. If the heliopad is located more than 30 minutes flying time from the fuel source, a refueling rig would still be required.

(4) The wind sock required at the helicopter pad arrived without the required frame and swivel and therefore could not be used until one was locally obtained.

(5) The net radio in the USAF Detachment office, and in two of the USAF vehicles, was mandatory due to the lack of adequate telephones. A net radio link is a mandatory requirement on future events of this type for administrative purposes.

7. Materiel: The Materiel Division (SWNM) of the Directorate of Nuclear Field Operations provided overall supply, aircraft maintenance, billeting and transportation support for two aircraft (UH-1F helicopters) and twenty-two personnel. Most of the support was provided in the Grand Valley area during

deployment for Project RULISON. The Materiel representative was responsible for operating the supply system, management of general and special purpose vehicles, billets, Imprest Fund Accounts and transportation of personnel and cargo for the deployment. The overall materiel support organizational concepts described in AFSC OPLAN 15-66 were used for this project and proved adequate. The AFLC Nuclear Supply Account, AFN 2307, at McClellan AFB, California, and the established USAF SEEK STRAW/SEEK PRIME precedence ratings were invaluable in the successful support provided to AFSWC Detachment 2 (Provisional). Supply problems encountered during this project were minor and were expeditiously resolved.

a. Planning and Build-Up: All resource requirements were identified early in the planning phase. No problems were encountered and agencies either provided the resources or a suitable substitute. Most of the resources were deployed from Kirtland AFB and Indian Springs AFAF, Nevada. One helicopter and crew were provided by Edwards AFB, California. All resources requested from AEC were furnished and in-place on the date requested.

b. Deployment and Operation: The Kirtland AFB Motor Pool and Transportation Division at Nellis AFB provided the transportation of equipment and supplies to the Grand Junction and Grand Valley, Colorado area. Services provided by Nellis AFB were excellent. All personnel were billeted in a single motel at reasonable rates arranged for by the

Materiel representative. Having all personnel billeted in one motel greatly simplified transportation arrangements and personnel control. Only three helicopter parts were ordered on the SEEK STRAW priority. The items were installed within three hours of receipt by the Maintenance personnel.

c. Roll-up: Roll-up was accomplished as established in Tab C, Appendix 4, Annex K, AFSC OPLAN 15-66.

d. Funds: Fund requirements for RULISON, which were extra-military costs (mostly TDY), were provided by Test Command/Defense Atomic Support Agency through a Military Interdepartmental Purchase Request (MIPR) issued to Kirtland AFB. Costs chargeable thereto are estimated at $5,880. Personnel man-days, aircraft flying hours, operating funds for USAF vehicles and supplies were funded by USAF at an estimated cost of $17,480. See Attachment 5 of this report for detailed accounting of the above costs.

8. Medical: The Medical Section for Project RULISON consisted of one medical technician who was trained in first aid. This individual and equipment remained at Grand Junction Airport except on D-Day when he deployed to the helicopter pad. On the first day of arrival, this NCO contacted the local hospital and presented a previously prepared "Letter of Authorization" from the 4900th AB Dispensary, Kirtland Air Force Base, thereby laying the groundwork for any medical emergencies beyond his capability or facilities. This will be a checklist item prior to deployment from Kirtland Air

Force Base on future deployments. Fortunately, other than an attack of hay fever, there were no injuries or illnesses during this project.

9. Rad-Safe: The Rad-Safe Section consisted of one USAF Rad-Safe officer who arranged for equipment and advised the Commander on all radiation safety matters. A contingency Rad-Safe plan was in effect for Project RULISON. Rad-Safe materiel requirements were tasked to the Eberline Instrument Corporation (EIC), the AEC Rad-Safe contractor, through the SWN Materiel Division. Contact was established with EIC personnel prior to deployment and on-site preparations began on D-2. Actual set-up of the Rad-Safe facility, which consisted of a field-type personnel decontamination arrangement, was carried out on D-Day. Film badges and dosimeters were issued to all crew members who were to be aboard H-Hour array aircraft. Two EIC radiation monitors were assigned to fly aboard each H-Hour array aircraft and to provide a monitoring capability after all aircraft recovered at the helicopter pad. The only deficiency encountered during the operation was that last minute operational considerations prevented the assigned Rad-Safe monitors from being aboard the H-Hour array aircraft. While not serious, this was a violation of Rad-Safe standard operating procedures. The absence of a monitoring capability could jeopardize the safety of the aircrews involved.

Recommendation: Recommend that the radiation monitors be aboard their assigned H-Hour array aircraft during

the first take-off on D-Day. Under no circumstances should they leave the aircraft before it has recovered at its assigned post-shot recovery site. These procedures will insure that a radiation monitor is aboard each H-Hour array aircraft at H-Hour.

10. Crash-Rescue: No crash rescue equipment was deployed to Grand Junction Airport. This was a result of the earlier pre-operational site visit which determined that Grand Junction had a O-11 fire truck, and the local firemen were trained in its use. Although it was not required, the airport manager agreed to put this truck on standby at the Air Force's request, otherwise it would be about 15 minutes before crash-rescue services would be available.

11. Security: Personnel were required to send security information to AFSWC (SWNC) prior to deployment. Clearances and badges were not required by the AEC except for those personnel requiring access to the timing and firing trailers. The Commander, AFSWC Det 2 (Prov), could make the required certifications to the AEC in those cases where badges were required. Although not required during RULISON, most projects require badging and the procedures are greatly expedited if the Commander has authority to certify the clearances of USAF personnel to the AEC.

12. Communications: Radio communications for aircraft at the AOC were discussed in paragraph 6. The Net 12 radio, at the Detachment office, could be used to contact personnel

at the AEC Operations Coordination Center. The Commander's and the Weapons Director's vehicle were equipped with a Net 12 radio so they could be in contact with both the Detachment office and the OCC. Landlines were satisfactory, but the majority of calls were long distance. Two landlines were installed in the Detachment office but no telephones were available at either the observation point or the helicopter pad. After the first day, all long distance telephone calls were made on the AEC FTS switchboard at Grand Junction or commercially using the AEC billing code. Telephone trunks to the OCC were adequate and much improved over the Project GASBUGGY OCC/AOC communications problem.

13. Administration: The administrative matters were outstandingly handled by the one administrative NCO programmed for Project RULISON. Since Command, Operations, Administration and most support activities were co-located at the FAA classroom, the single administrative specialist was sufficient. Manning was essentially that outlined in Appendix 4, Annex K, to AFSC OPLAN 15-66 (Project RULISON). The jet engine specialist was required for contingency purposes to check and service the UH-1F engines. All records and correspondence and the Frag Order generated by the Detachment were produced and maintained by the administrative NCO. A ditto machine was used to produce copies of the Frag Order and the "T" series special orders published by the Detachment. The following is a summary of man-days of effort involving TDY for

Project RULISON. Man-days of effort expended in planning are not included.

Deployment Summary:

RANK	NUMBER	MAN-DAYS
LT COL	1	16
MAJ	4	58
LT	1	14
SMSGT	1	16
MSGT	1	16
TSGT	4	47
SSGT	7	86
SGT	4	28
A1C	2	14
TOTAL:	25	295

Staff Visit Summary:

RANK	NUMBER	MAN-DAYS
COL	1	5

14. Summary: No two off-site tests are exactly alike. RULISON was unique in the almost completely unclassified nature of the test and the adverse reaction generated by a small number of "hippies". This latter factor demonstrated the requirement for planning flexibility, for none of the missions scheduled for H-Hour on the helicopters was flown. Instead of photography and standby, the emphasis was on security of SGZ and the firing cable. This forced changes based on the real-time situation, but this must be expected.

Throughout the planning and execution phase, the question must be, "What if.....?" Any support plan in the austere resource environment must be flexible enough to encompass changes in requirements without major revisions of the plan. Plan for every known contingency - decreasing support requirements as execution approaches is easier than increasing them. Record and save copies of all forms, correspondence, operating instructions, publications and messages relative to air support for the Project. These communications are maintained in the permanent files of the Continental Test Division. These files should be reviewed prior to planning future projects.

Walter K. Rickert

WALTER K. RICKERT, Colonel, USAF
Director, Nuclear Field Operations

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DEPARTMENT OF THE AIR FORCE
DETACHMENT 2 (PROVISIONAL)
HEADQUARTERS AIR FORCE SPECIAL WEAPONS CENTER (AFSC)
Walker Field, Grand Junction, Colorado 81501

AFSWC Detachment 2 (Provisional) 3 September 1969
Frag Order 69-1

References: AFSC OPlan 15-66.
Appendix 4, Annex K, AFSC OPlan 15-66.
USAEC Test Manager's Operations Plan Project RULISON, dtd 28 August 1969.

1. MISSION: To provide air support to the Project RULISON Test Manager to include operational control of all USAF aircraft and resources operating in support of Project RULISON and control of all aircraft operating in the test area air space.

2. GENERAL: This Frag Order supplements Appendix 4 to Annex K, AFSC OPlan 15-66 (Project RULISON). It is effective upon receipt and will continue in effect, with such changes and supplemental instructions as may be necessary until each supporting element is released by the Commander, AFSWC Det 2 (Prov) for return to home station.

3. EXECUTION:

a. Concept: All aircraft operating in the Project RULISON test area will be controlled by the AOC, call sign FARADAY. The AOC will be located at the Control Point. Aircraft will contact the AOC prior to entering the controlled area (area within 5NM of ground zero) or arriving on station if outside the controlled area. Aircraft will be under the control of the AOC at all times while in the controlled area. Radio silence will be observed from H-5 minutes except for emergencies. Aircraft call signs and frequency assignments will be in accordance with Attachment 2. FARADAY will monitor 126.3 and 261.1 or 296.3 while aircraft are airborne.

b. USAF Missions: Pre-shot and post-shot missions will be flown at the request of the Test Manager with the approval of the Commander, AFSWC Det 2 (Prov). D-day missions 1 through 5 are under the operational control of the Commander, AFSWC Det 2 (Prov) and are identified and described as follows:

(1) Mission 1: Security sweep performed by a UH-1F helicopter, call sign HOBART 1. The purpose of this mission is to report all unauthorized traffic/personnel in the first phase evacuation area (SGZ to 2.3 mile radius) and to provide a preliminary evaluation of roadblock readiness if required.

Atch 1

Information will be relayed to the AOC if the AEC net radio system fails. Aircraft will patrol the area from SGZ to 2.3NM radius. The mission will begin at H-6 hours and continue until approximately H-3½ hours or until released by the security personnel. Pax pickup at the pad; return to the pad and refuel.

(2) Mission 2: Essentially the same as mission 1. Will be executed by HOBART 2.

(3) Mission 3: Security sweep performed by a UH-1F helicopter, call sign HOBART 2. The purpose of this mission is to report all unauthorized traffic/personnel in the second phase evacuation area (SGZ to 5 mile radius) and to provide another evaluation of roadblock readiness if required. Information will be relayed to the AOC if the AEC net radio system fails. Aircraft will patrol the area from SGZ to 5NM radius. The mission will begin at H-1½ hours and continue until approximately H-15 minutes or until released by the security personnel. Pax pickup at the pad; return to the pad and refuel.

(4) Mission 4: Photo mission by a UH-1F helicopter, call sign HOBART 2. The purpose of this mission is to provide documentary photo coverage of surface zero. Helicopter will be positioned 2000' AGL and 2000' upwind from SGZ. Upwind vector to be provided by AOC. Aircraft should be on station at H-15 minutes and will terminate upon request of the photographic personnel. Pax pickup at the pad; return to the pad and refuel.

(5) Mission 5: UH-1F helicopter, call sign HOBART 1, Test Manager's Standby. Full fuel load. Standby on the pad. Mission briefing to be given by the AOC depending upon requirements. Mission release from the AOC.

c. USAEC Missions: Missions will be controlled by the Commander, AFSWC Det 2 (Prov) in the same manner as USAF missions but only while aircraft are within the controlled area.

d. Emergency Procedures: In-flight emergencies will be handled in accordance with the appropriate aircraft manual. FARADAY will be advised of any emergency and will be the relay point for any required assistance. Any aircraft experiencing radio failure while in the test array will exit the test area, avoiding overflight of SGZ and the area within 1000' of SGZ. Aircraft will exit the test area at the last assigned altitude, then fly in accordance with AFM 60-16 to Walker Field, Grand Junction, Colorado or other suitable location at the pilot's discretion. Upon landing the pilot will call the Control Point by telephone (625-2417) or by Net 12 radio, and confirm departure and safe landing.

e. Communications: Call signs assigned in Attachment 1 (Mission Execution Chart) are authorized for use within the controlled area and enroute to and from the controlled area from Walker Field. Tactical call signs will not be used when communication is required with flight facilities other than FARADAY.

f. Rad-Safe: All military aircraft will be checked for radiological contamination regardless of mission participation and will be certified by an Air Force Rad-Safe Officer and the Commander, AFSWC Det 2 (Prov) prior to departing for home station:

(1) UH-1F aircraft will recover at the helicopter pad after H-hour. Aircraft will not depart the pad until cleared by Eberline Rad-Safe personnel. In case of contamination aircrews will receive further specific instructions from Rad-Safe personnel.

(2) Final Rad-Safe clearance for USAF helicopters will be accomplished by the Commander, AFSWC Det 2 (Prov) at Walker Field.

Max O. Jesperson

MAX O. JESPERSON, Lt Col, USAF
Commander

3 Atch
1. Mission Execution Chart
2. H-hour Positioning Data
3. Test Array

3 Sep 1969
Change 1

MISSION EXECUTION CHART (MEC)

LINE NO.	TYPE ACFT & CALL SIGNS	DEPART BASE	START ENG	TAXI	TAKE OFF	ENROUTE OUTBOUND ALT	ENROUTE OUTBOUND TAS	ENROUTE OUTBOUND FIX	ON/OFF ORBIT	ENROUTE INBOUND ALT	ENROUTE INBOUND TAS	ENROUTE INBOUND FIX	LAND	REMARKS
1	UH-1F HOBART 2	WALKER	-	-	0700	1500' AGL	80	-	N/R	-	-	-	PAD	FERRY FLT TO PAD
2	UH-1F HOBART 1	WALKER	-	-	0800	1500' AGL	80	-	N/R	-	-	-	PAD	FERRY FLT TO PAD
3	UH-1F HOBART 2	PAD	0755	-	0800	As Req	0-80	GZ	N/R	As Req	0-80	GZ	PAD	-6 HR SECURITY SWEEP
4	UH-1F HOBART 1	PAD	0855	-	0900	As Req	0-80	GZ	N/R	As Req	0-80	GZ	PAD	-6 HR SECURITY SWEEP
5	C-45 VEGAS 2	WALKER	-	-	1130	12K		CP	-3 HR As Req	12K		-	WALKER	RADIO RELAY RACETRACK 195° FROM CP
6	UH-1F HOBART 2	PAD	1325	-	1330	As Req	0-80	GZ	-1½ HR As Req	As Req	0-80	GZ	PAD	-1½ HR SECURITY SWEEP
7	CESSNA 185		-	-		VFR		G.V.	-1 HR	VFR				ORBIT GRAND VALLEY FISH & PARKS(BULL HORN)
8	TURBO VEGAS 7	WALKER	-	-	1400	11.5		C.P	-30 MIN	11.5			WALKER	SAMPLER ORBIT EW OVER CP
9	UH-1F HOBART 2	PAD	-	-	1430	10.0	80	GZ	-15 MIN	10.0	80		PAD	PHOTO 2000'/2000'
10	UH-1F HOBART 1	PAD	-	-									PAD	TM STANDBY AT PAD
11														
12	MARTIN 404 #409	LAS	-	-	-	FAA			As Req					NATS STANDBY
13	UH-1F HOBART 1	PAD	-	-	A/R	1500' AGL	80	-	N/R	-	-	-	WALKER	RTB
14	UH-1F HOBART 2	PAD	-	-	A/R	1500' AGL	80	-	N/R	-	-	-	WALKER	RTB

AFSWC FORM JUL69 0-92

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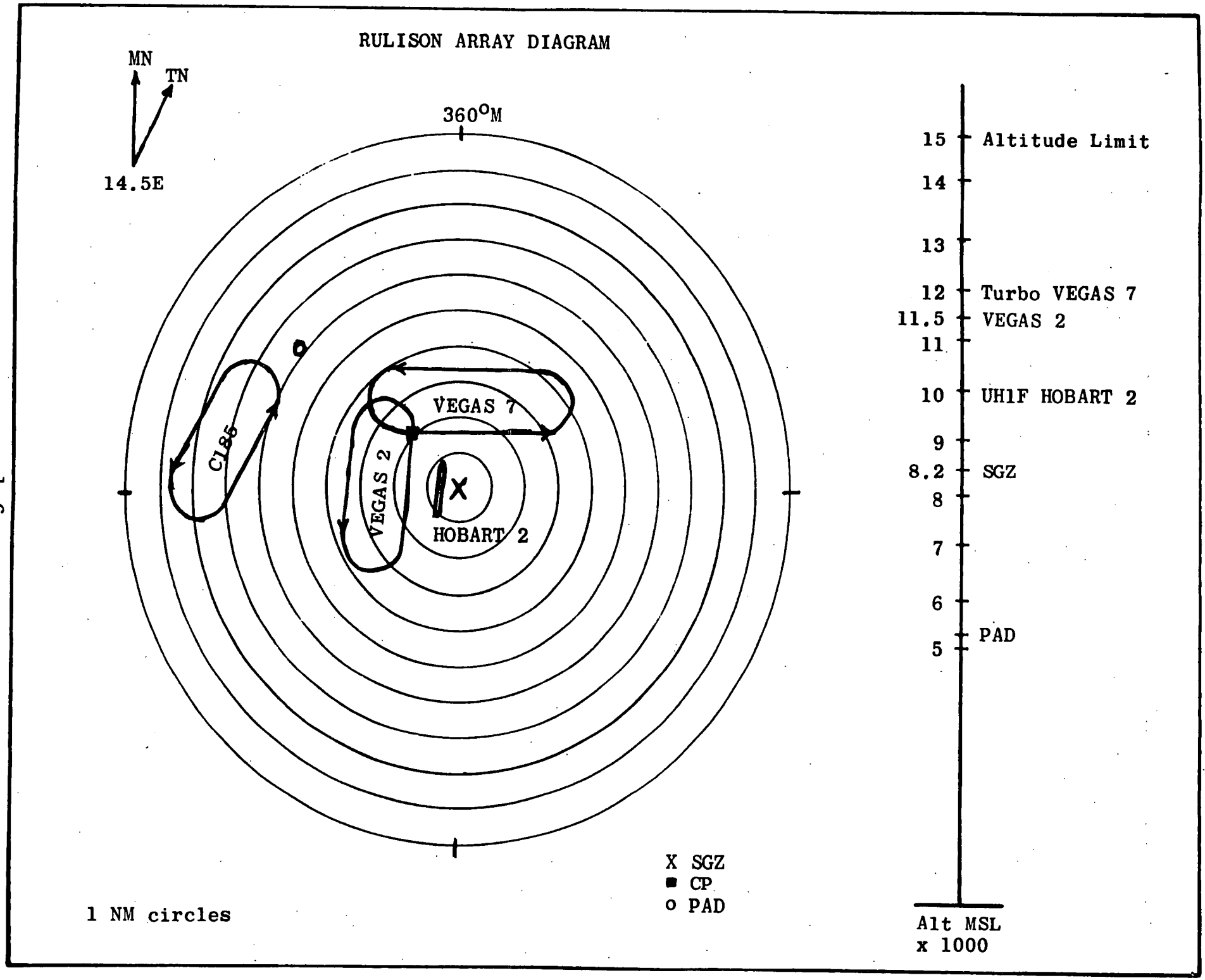
H-HOUR POSITIONING DATA

(TO BE PUBLISHED AS NECESSARY)


RULISON ARRAY DIAGRAM
MN
TN
14.5E
360°M
C186
VEGAS 7
VEGAS 2
HOBART 2
X SGZ
CP
o PAD
1 NM circles
15
Altitude Limit
14
13
12
Turbo VEGAS 7
11.5
VEGAS 2
11
10
UH1F HOBART 2
9
8.2
SGZ
8
7
6
PAD
5
Alt MSL
x 1000

GROUND MISSION EXECUTION CHECKLIST

ITEM NO.	DESIRED ITEM	ITEM	ACTION AGENCY	TO	ACCOMPLISHED TIME	ACCOMPLISHED INITIALS
1	0850	AOC MANNED	AOC	OCC	0850	
2		RADIOS CHECKED	AOC	-	0850	
3		REFUELING TRUCK LEAVES WALKER FIELD	DET 2	AOC		
4		ALL PERSONNEL IN PLACE AT THE PAD	PAD	AOC		
5		REFUELING TRUCK RETURNS TO WALKER FIELD	AOC	PAD		
6		HELO PAD OPNS CLOSED	AOC	OCC		

2-1

Attch 2

GROUND MISSION EXECUTION CHECKLIST

ITEM NO.	DESIRED ITEM	ITEM	ACTION AGENCY	TO	ACCOMPLISHED	
					TIME	INITIALS
7		AOC CLOSED	AOC	OCC		

AFSWC FORM JUL() 0-92B

AFSC (KAFB NM) 1969

D-DAY

AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
1	R- 8:00 Z- 1300 L- 0700	R- Z- L-	R- Z- L-	HELICOPTER LEAVES WALKER FIELD FOR PAD	DET 2	FARADAY
1.1	R- 7:00 Z- 1400 L- 0800	R- Z- L-	R- Z- L-	HELICOPTER LEAVES WALKER FIELD FOR PAD	DET 2	FARADAY
2	R- 6:00 Z- 1500 L- 0900	R- Z- L-	R- Z- L-	PIBAL (100 gm) RELEASE FROM CP	FARADAY	HOBART 1 HOBART 2
	R- Z- L-	R- Z- L-	R- Z- L-			
	R- 5:45 Z- 1515 L- 0915	R- Z- L-	R- Z- L-	HELICOPTERS ON THE PAD AND IN COMMISSION	HOBART 1 HOBART 2	FARADAY

AFSWC FORM JULES 0-92A

AFSC (KAFB NM) 1969

D-DAY

AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
4	R- 5:00 Z- 1600 L- 1000	R- Z- L-	R- Z- L-	PIBAL (100 gm) RELEASE FROM CP	FARADAY	HOBART 1 HOBART 2 VEGAS 7
	R- Z- L-	R- Z- L-	R- Z- L-			
5	R- 5:00 Z- 1600 L- 1000	R- 4:40 Z- 1620 L- 1020	R- Z- L-	BEGIN FIRST SECURITY SWEEP OF CLOSED AREA	FARADAY	HOBART 1 HOBART 2
	R- Z- L-	R- Z- L-	R- Z- L-			
6	R- 4:15 Z- 1645 L- 1045	R- Z- L-	R- Z- L-	USPHS TAKES CONTROL OF NET RADIOS	USPHS	ALL

AFSWC FORM 0-92A

AFSC (KAFB NM) 1969

D-DAY

AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
7	R- 4:00 Z- 1700 L- 1100	R- Z- L-	R- Z- L-	PIBAL (100 gm) FROM CP	FARADAY	HOBART 1 HOBART 2 VEGAS 7
	R- Z- L-	R- Z- L-	R- Z- L-			
8	R- Z- L-	R- Z- L-	R- Z- L-	TERMINATED SECURITY SWEEP, RETURNING TO PAD	HOBART 2	FARADAY
	R- Z- L-	R- Z- L-	R- Z- L-			
9	R- 3:45 Z- 1715 L- 1115	R- Z- L-	R- Z- L-	RAOB (600 gm) FROM CP	FARADAY	HOBART 1 HOBART 2 VEGAS 7

AFSWC FORM 0-92A

AFSC (KAFB NM) 1969

D-DAY

AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
10	R- 3:00 Z- 1800 L- 1200	R- Z- L-	R- Z- L-	PIBAL (100 gm) FROM CP	FARADAY	HOBART 1 HOBART 2 VEGAS 7
	R- Z- L-	R- Z- L-	R- Z- L-			
11	R- 2:00 Z- 1900 L- 1300	R- Z- L-	R- Z- L-	PIBAL (100 gm) FROM CP	FARADAY	HOBART 1 HOBART 2 VEGAS 7
	R- Z- L-	R- Z- L-	R- Z- L-			
12	R- 1:00 Z- 2000 L- 1400	R- Z- L-	R- Z- L-	BEGIN SECOND SECURITY SWEEP OF CLOSED AREA	FARADAY	HOBART 2

AFSWC FORM JULY 69 0-92A

AFSC IKAFB NM, 1969

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AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
13	R- 1:00 Z- 2000 L- 1400	R- Z- L-	R- Z- L-	PIBAL (100 gm) FROM CP	FARADAY	HOBART 1 HOBART 2 VEGAS 7
13.1	R- 0:50 Z- 2010 L- 1410	R- Z- L-	R- Z- L-	785J to orbit SGZ. Return to H-Hour position at H-30 minutes to warn Hippies.	FARADAY	HOBART 1 HOBART 2
14	R- Z- L-	R- Z- L-	R- Z- L-	TERMINATED SECURITY SWEEP, RETURNING TO PAD	HOBART 2	FARADAY
	R- Z- L-	R- Z- L-	R- Z- L-			
15	R- 0:30 Z- 2030 L- 1430	R- Z- L-	R- Z- L-	USPHS GIVES WIND DATA TO A/C ON NET	USPHS	VEGAS 2 VEGAS 7

AFSC IKAFB NM, 1969

D-DAY

AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
16	R- 0:30 Z- 2030 L- 1430	R- Z- L-	R- Z- L-	PASS WIND VECTOR TO HELO PAD	FARADAY	HELO PAD
	R- Z- L-	R- Z- L-	R- Z- L-			
17	R- 0:30 Z- 2030 L- 1430	R- Z- L-	R- Z- L-	USPHS AIRCRAFT, VEGAS 7 ON STATION	VEGAS 7	FARADAY
	R- Z- L-	R- Z- L-	R- Z- L-			
18	R- 0:20 Z- 2040 L- 1440	R- Z- L-	R- Z- L-	PHOTO HELICOPTER AIRBORNE	HELO PAD	FARADAY

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AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
19	R- 0:15 Z- 2045 L- 1445	R- Z- L-	R- Z- L-	HELICOPTER ON STATION HELICOPTER ON HELO PAD	HOBART 1 HOBART 2	 FARADAY
	R- Z- L-	R- Z- L-	R- Z- L-			
20	R- 0:15 Z- 2045 L- 1445	R- Z- L-	R- Z- L-	PHOTO HELICOPTER ON STATION	HOBART 1 TO AIR ADVISOR	 DONO
	R- Z- L-	R- Z- L-	R- Z- L-			
21	R- 0:05 Z- 2055 L- 1455	R- Z- L-	R- Z- L-	RADIO SILENCE EXCEPT EMERGENCY TRAFFIC	ALL	

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AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
22	R- 00 Z- 2100 L- 1500	R- Z- L-	R- Z- L-	ZERO HOUR	ALL	
	R- Z- L-	R- Z- L-	R- Z- L-			
23	R- 00 Z- 2100 L- 1500	R- Z- L-	R- Z- L-	RAOB (600 gm) RELEASED FROM CP	FARADAY	HOBART 1 HOBART 2 VEGAS 7
	R- Z- L-	R- Z- L-	R- Z- L-			
24	R- Z- L-	R- Z- L-	R- Z- L-	AIRCRAFT RELEASED	DONO	FARADAY

AFSC (KAFB NM) 1969

D-DAY

AIR MISSION EXECUTION CHECKLIST

ITEM NO.	EVENT TIMES PROGRAMMED	RECYCLED	RECYCLED	ITEM	ACTION AGENCIES	TO
	R- Z- L-	R- Z- L-	R- Z- L-			
25	R- Z- L-	R- Z- L-	R- Z- L-	RELEASED TO PAD	FARADAY	HOBART 1 HOBART 2
	R- Z- L-	R- Z- L-	R- Z- L-			
26	R- Z- L-	R- Z- L-	R- Z- L-	AIRCRAFT DEPART PAD FOR WALKER FIELD	HOBART 1 HOBART 2	FARADAY
	R- Z- L-	R- Z- L-	R- Z- L-			
27	R- Z- L-	R- Z- L-	R- Z- L-	HELICOPTERS ON GROUND AT WALKER FIELD	FARADAY ALPHA	FARADAY

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AFSC (KAFB NM) 1969

UH-1F FLYING HOUR COSTS*

90.8 Hours @ $121 per hour	$10,986.80

PER DIEM COSTS

300 Days @ $16	$4,800.00

MAN DAY COSTS*

TYPE	TOTAL	COST PER DAY	COST
Officers	95	$37.57	$3,531.58
Enlisted	205	$15.68	$3,214.40
		TOTAL	$6,745.98

POL

5400 Gallons of JP-4 @ $.117 per gallon	$ 631.80

SUPPLIES/TRANSPORTATION

Supplies	$ 516.00
Transportation (MD-3)	$ 850.00
TOTAL	$1,366.00
Total Extra-Military Costs	$5,877.99
Total Service Costs	$19,567.76

* Cost factors obtained from AFM 172-3.

NORS/NORM RATE

NORS Rate	0.0%
NORM Rate	0.6%

GENERAL PURPOSE VEHICLES

TYPE	USER	RENTAL	COST GAS	REPAIR
Station Wagon (1)	Commander	$ 0	$53.48	$43.87
Station Wagon (1)	Wpns Controller	0	52.42	0
Carryall (2)	Rad-Safe	70.69	0	0
Carryall (2)	Operations	53.30	0	0
Pick-up (1)	Materiel	0	37.69	2.00
6 Pax P/U (3)	Maintenance	0	53.43	0
TOTAL		$123.99	$197.02	$45.87

(1) Source: 4900th ABG Motor Pool

(2) Source: GSA Motor Pool, Grand Junction

(3) Source: DASA (Mercury)

SPECIAL PURPOSE VEHICLES

Refueler	N/A	$ 0	$177.62	$78.63
Refueler	N/A	0	163.00	25.04
TOTAL		$ 0	$340.62	$103.67

AIRCRAFT PARKING FEE

12 Days @ $5.00 for two UH-1F Aircraft	$120.00

AEROSPACE GROUND EQUIPMENT

TYPE	QUANTITY	FURNISHED BY	COST
MD-3 Power Unit	2	ISAFAF	No Cost
Fire Extinguisher (50 lbs., CO_2)	2	Kirtland AFB	No Cost
Generator, Power	1	AEC	No Cost